SCIENCE.

FRIDAY, FEBRUARY 26, 1886.

COMMENT AND CRITICISM.

PROFESSOR FREDERICQ of the University of Ghent, who has previously published essays on the modes of teaching history in Germany and in France, has recently issued a pamphlet on the study of history at the English and Scotch universities. At the latter he finds that little or no university instruction in history is given, but passes much favorable criticism on the methods in the historical schools of Oxford and Cambridge. Professor Fredericq makes one remark that we may well take home to ourselves; and that is, that the English universities provide no adequate education in what the Germans call 'Quellenstudie.' Anyone who has seen an historical seminar at a German university knows what an important part of historical instruction is made up by the study of chronology, paleography, and documents: in fact, the study of authorities forms the basis of all historical teaching in Germany. Edward A. Freeman, in his inaugural lecture, on 'The office of the historical professor,' delivered at Oxford in the autumn of 1884, touched upon this point, and announced his intention of giving much attention to the study of authorities. It is well known that Professor Seeley of Cambridge, and Prof. S. R. Gardiner also, have not failed of their duty in this particular; but with them we fear that the list ends. And in America we have until lately almost entirely overlooked this essential in historical knowledge. But the Johns Hopkins university, and, in a less degree, Columbia college, are pursuing the right method; and at both the historical student is taught to estimate and handle original materials, not merely stuffed with facts and dates at second-hand. It is only in this way that the student can ever obtain any thing more than a superficial knowledge of his subject, and come thoroughly in contact with the times he is investigating. It is not too much to say that the study of history without historical method is empty, and historical method is the greatest part of the study of history. If Professor Fredericq ever includes America in his investigations, we fear that the list of historical teachers who appreciate the value of 'Quellenstudie' will be even smaller than in England.

MR. BRADFORD LESLIE, in a paper read before the British institution of civil engineers, 'On an improved method of lighting vessels under way at night,' attempts to solve the difficult problem of enabling ships which are rapidly approaching at night, to determine their respective courses in time to manoeuvre with safety. To secure this result, many arrangements of lights have been proposed, but none, we believe, exactly like that suggested by Mr. Leslie. His plan, in general, is for a steamer to carry three white lights forward (two for a sailing-vessel), — one at the masthead, one on the forestay, and one on the stem; the three in line, and making an angle of 45° with the horizon. These would be plainly visible for eight or nine miles through a forward arc of 220°, or from two points abaft the beam on each side. It is evident that the course of the ship, under favorable circumstances, could be known always by observing the divergence between the line of the lights and the vertical. This angle decreases from 45°, for a course at right angles to the observer, to 0° when the ship is approaching head on. The latter, and those which approximate to it, are obviously the most critical courses, for which this system is especially valuable. The apparent angle of the line of lights with the vertical coincides nearly enough, for all practical purposes, up to 20°, or about two points, with the angle between the course of the approaching ship and the line of vision. This fact is of great value when there is no time to determine angles, either by plotting or calculation. It is not proposed to abandon the use of the colored side-lights, although, if the arrangement were entirely satisfactory in practice, they would be no longer necessary. The most serious obstacle to the success of this plan is the rolling and heeling motion of the ship, to which Mr. Leslie refers, but which, we believe, he underestimates. The principle involved in his suggestion is not new. It has been already proposed to arrange the masthead and side-lights to form an equilateral triangle in a plane parallel to the midship section, and also to place the masthead light so far aft that the line through it and either

of the side-lights should make an angle of 45° with the horizon. The system which has received the most attention, however, is known as that of the double side-lights. Various arrangements of these have been proposed, but all include the use of two lights on each side, in different positions with respect to each other, and at different distances apart. The subject of lighting ships, and also that of 'the rules of the road,' should be referred to an international commission, whose recommendations should be accepted and rigidly enforced by all maritime nations.

THE STUDY OF THE POLITICAL SCIENCES has made great progress of late in this country. Columbia, Cornell, and the University of Michigan, have established special schools of political science, all of which are successful; special attention is paid to these subjects at Harvard and Johns Hopkins; and the historical, economic, and social science associations, which have sprung up during the last decade, with their published proceedings, have all contributed to stimulate an interest in the scientific treatment of history, law, and economics. The latest advance in this field is the establishment of the *Political science quarterly*, edited by the faculty of political science of Columbia college, and published by Ginn & Co. The first number of this new quarterly will appear in March, and it will furnish a field for the discussion of all questions — historic, economic, or legal — which concern the organization of the state, the evolution of law, the relation of states one to another, and the relation of government to the individual. The quarterly will demand no political or economic orthodoxy, but will admit all articles within its scope which are at once scientific and of general interest. A feature of the publication will be its bibliography, which will be very complete and elaborate. The great success of the Johns Hopkins series of studies in historical and political science has doubtless led the Columbia professors to the establishment of this journal; and there is every prospect that it, too, will meet with favor. The whole development of which the above are the indications is a healthy and vigorous one. It betokens the introduction and application of scientific tests and methods in a domain which has in the past been too fruitful of partisan strife and dissensions.

IN 1880 A SITE was purchased for a new naval observatory a short distance beyond Georgetown, in the District of Columbia; but no appropriation has yet been made for erecting the necessary buildings, and removing the instruments from the present location. On account of this delay the secretary of the navy, in April, 1885, called upon the National academy of sciences for an expression of opinion as to the advisability of proceeding promptly with the erection of a new naval observatory; and the reply of the committee of the academy is contained at length in a letter from the secretary of the navy, just published as Executive document No. 67. The conclusions of the committee we give in the language of the report. This report is signed by F. A. P. Barnard, A. Graham Bell, J. D. Dana, S. P. Langley, Theodore Lyman, E. C. Pickering, C. A. Young. 1. It is advisable to proceed promptly with the erection of a new observatory upon the site purchased in 1880 for this purpose. 2. It is advisable that the observatory so erected shall be, and shall be styled, as the present observatory was styled originally, the 'National observatory of the United States,' and that it shall be under civilian administration. 3. It is advisable that the instruments in the present observatory, with the exception of the 26-inch telescope, the transit circles, and the prime vertical transit, shall be transferred to the observatory at Annapolis, with such members of the astronomical staff as may be required to operate them; also that such books of the library as relate chiefly to navigation shall take the same destination; the instruments above particularly specified, with the remainder of the library, being reserved as part of the equipment of the new national observatory, to which also the remaining officers of the astronomical staff shall be assigned for duty. 4. It is advisable that the observatory at Annapolis shall be enlarged, if necessary, and adapted to subserve as effectually as possible the wants of the naval service, whether practical, scientific, or educational; that it shall be under the direction of the department of the navy, and shall be styled the 'Naval observatory of the United States.' The grounds upon which this decision is based are set forth in the document to which we have referred; and numerous letters are appended, from astronomers and others, in regard to the administration of the observatory, and from physicians of Washington, upon the healthfulness of the portion of the city in which the observatory is at present situated. It will be seen immediately that this report is intended to favor the establishment of an observatory worthy

of the country, and the placing its control in the hands of those who have made astronomy their life-work. The navy will be provided, if the recommendations are carried out, with an observatory well suited to its special needs, and would be relieved from the task of supervising work in which it has no interest aside from that felt in scientific work in general.

CRATER LAKE, OREGON, A PROPOSED NATIONAL RESERVATION.

IN the heart of the Cascade Range there is a little sheet of water which is destined to take high rank among the wonders of the world. It is a unique phenomenon, taken as a whole, though some of its component features, taken singly, may not be unexampled. The lake is about seven and one-half miles long and five miles wide. Its shape is very nearly elliptical, without bays or promontories. It is girt about by a complete circuit of cliffs, nowhere affording an outlet. These cliffs rise to altitudes varying from 900 to 2,200 feet above the water, and, though generally too steep to be either ascended or descended, have in some places an inclination low enough to render such a feat possible, though difficult. They plunge at once into deep water, and never afford a wide margin for standing or walking room at the water's edge. In a few places, however, the rains have scoured gulleys in the wall; and, where these debouch upon the lake surface, may be found narrow spaces for lodgement. No considerable stream or brook has been discovered flowing into the lake as yet; but a few springs yield little rills of water in the faces of the walls. Others and larger ones may come to light when the lake is more minutely explored. Neither is there any visible outlet. It is certain, however, that there must be a mode of escape for the water; and, as it is not above ground, it must needs be below ground, for the evaporation here is less than the precipitation.

Near the south-western margin, about half a mile from the shore, there rises out of the water a cinder-cone. Its height is between 600 and 700 feet. It is quite perfect and typical in form, having the usual cup or hopper in its summit, and as yet it is not perceptibly eroded. It is well covered with timber, and, notwithstanding its perfect preservation, it cannot be regarded as being, in the historic sense, a recent creation. From its base two streams of lava stretch out towards the great wall, but do not reach it. The insulation of the cone and its lavas is still complete.

The beauty and majesty of the scene are indescribable. As the visitor reaches the brink of the cliff, he suddenly sees below him an expanse of ultramarine blue of a richness and intensity which he has probably never seen before, and will not be likely to see again. Lake Tahoe may rival this color, but cannot surpass it. It is deeper and richer than the blue of the sky above on the clearest day. Just at the margin of the lake it shades into a turquoise, which is, if possible, more beautiful still. Ordinarily the water surface is mirror-like, and reflects an inverted image of the surrounding cliffs in detail. Very majestic, too, are the great environing walls. On the west side they reach their greatest altitude, rising almost vertically more than 2,000 feet above the water. It is difficult to compare this scene with any other in the world, for there is none that sufficiently resembles it; but, in a general way, it may be said that it is of the same order of impressiveness and beauty as the Yosemite valley. It was touching to see the worthy but untutored people, who had ridden a hundred miles in freight-wagons to behold it, vainly striving to keep back tears as they poured forth their exclamations of wonder and joy akin to pain. Nor was it less so to see so cultivated and learned a man as my companion hardly able to command himself to speak with his customary calmness.

To the geologist this remarkable feature is not less impressive than it is to the lover of the beautiful; for, almost at the first glance, it reveals something which would probably escape the eye of the mere tourist. This broad depression was once filled and occupied by a large volcanic cone, rising far above the loftiest point of its encircling walls.

The proof is simple and conclusive. Whoever has studied a large volcanic cone, composed of lavas piled sheet upon sheet around a central orifice, and which has been subject to long-continued erosion, will be able to recall some general facts as to the ravines and water-courses which have been scoured in its flanks. As we approach such a mountain, we observe the ravines opening upon the plain, or gentle slope, around its base, with huge buttresses between them, sometimes rounded and broad, sometimes narrow and knife-edged, according as the spaces between ravines are great or small. As we ascend the bed of any one of them, we observe that it grows deeper and deeper, while the intervening buttresses rise higher and higher, until a maximum depth is reached. Farther up, the declivity of the bed becomes greater, lateral streams come in, the ravine branches repeatedly, and up near the summit it resolves itself into a plexus of small rills, all embraced in an amphitheatre,

above which the culminating peak rises sharply. Each portion of the length of the ravine has its characteristic features or habitus; and, however irregular these minuter details may be, they seldom mask or obscure the characteristics of the larger ones.

Imagine, then, a great volcanic cone, on which erosion has made considerable though not extreme progress, to be truncated at about one-third to one-half the height above the base, the upper half or two-thirds of the altitude removed, and a vast depression excavated in the remaining portion. The steep wall-faces of this excavation would cut the buttresses and ravines a little below the maximum depths of the latter. The crest-line at the edge of the pit, as we followed around its periphery, would rise sharply to go over the buttresses, and descend as sharply to cross the beds of the old ravines, making it a jagged edge. It is so at Crater Lake. As we ascend the ravines, we find them growing deeper and steeper, until at last their upper courses are suddenly cut off at the brink of the great pit. On either hand rises the old buttresses many hundreds, sometimes more than a thousand, feet above us. The imagination only can picture the restoration of the missing pile and the upward continuation of the great ridges and furrows now ending so strangely, and otherwise unaccountably, upon the brink of this deep gulf. Whether the mountain culminated in a sharp and lofty cone like Mt. Pitt and Mt. Scott to the south of it, and Mt. Thielson to the north, or was a somewhat flatter structure like Union Peak to the east of it, is more doubtful. The general configuration of the ravines, and the absence of large masses of tuff, or fragmental ejecta, in the original pile, indicate the flatter, or dome-like form; and this is decidedly the prevailing form of mountains in the Cascade Range, though many sharp peaks are scattered among them. What dire catastrophe has destroyed this cone?

Great pit-craters, or, as I have termed them elsewhere, 'calderas,' are not very common. Still they exist in several parts of the world; and of some of them we know the history, or may infer it with considerable confidence.

There are three or four large ones in the Hawaiian Islands. One is on the summit of Mauna Loa; a second is the famous Kilauea; and the largest and most wonderful of all is the immense caldera of Haleakala, on the island of Maui. But none of them are so large as Crater Lake, nor so deep. The origin of these I have endeavored to explain in a paper on the Hawaiian volcanoes, published in the 'Fourth annual report of the U.S. geological survey.' In the correctness of this explanation I feel great confidence. The evidence of it is summed up in the paper referred to. These 'craters,' or calderas as they are there called, appear to have been formed gradually, through the melting of the cores of the mountains by superheated lavas (i.e., lavas of higher temperature than is necessary for the fusion of their materials), rising from great depths in the earth through volcanic pipes. The peculiarities of the Hawaiian lavas are the absence or rarity of explosive or violent action, their high temperature and great liquidity. They rise in the volcanic pipes, and remain stationary at a certain altitude; and in Kilauea they maintain large lakes of lava open to the sky in a state of continuous fusion. But beneath the floor of the caldera they form lakes of still greater extent. Eruptions occur from time to time; but the lavas, instead of overflowing from the summit of the volcanic pile, burst out miles away from it, and far down the gently sloping sides of the cone at levels thousands of feet lower than the crater. The lavas beneath the caldera are drained; and the upper portion of the mountain, robbed of the liquid support which has held it up, sinks in. The surface-rocks, being vesicular or spongy, are light enough to float on the liquid lava so long as the latter maintains its level in the stand-pipe; but, when the liquid is tapped off through a lateral vent in the mountain-side, the upper crust settles, as would the ice in a pond when the water is drained from beneath it. The evidence of this action at Kilauea, on Mauna Loa, and still more emphatically on Haleakala, is very clear and unmistakable.

But there is another class of calderas, formed by a mode of volcanic action which is in the strongest possible contrast with the foregoing; and we are not left in any doubt as to its general nature, for it has been witnessed and reported upon by competent authority. In the islands of the East Indian archipelago, stretching from the Straits of Sunda eastward to the island of Timor, is found a chain of volcanoes comprising hundreds of individual cones. During the period of occupation of these islands by the Dutch, numerous eruptions have occurred; and the most characteristic feature of them has been their terrible and devastating energy. Some of the volcanoes are truncated cones, with large calderas in their summits. Two of them have been formed within the historic period, and accounts of their formation have been preserved. One of these, in the summit of the volcano Papandayang, on the island of Java, was formed in 1772, by an explosion rivalling in destructiveness and energy the outbreak of Krakatoa in 1883. The other is found in the summit of the volcano Tomboro, on

the island of Sumbawa, and the date of its formation was 1815. The incidents of this last eruption were investigated by Dr. Junghuhn, whose work on the volcanoes of the East Indies is now a classic one in the annals of volcanism. Judging from his account, this must have been the most energetic and destructive explosion of which any authentic account has been preserved, surpassing greatly that of Krakatoa. Prior to the outbreak, Tomboro was a shapely cone, rising a few miles from the shore to an altitude of more than 9,000 feet. In a single night the upper 5,000 feet was blown into fragments, which were scattered over thousands of square miles of sea and land; while the volcanic dust darkened the air over a million square miles of island and ocean. Many months afterward, when the scene could be visited, Tomboro was a mere stump of a mountain, with a large crater in the place of the cone which had been blown away. Other instances of a similar nature might be mentioned, but the foregoing may suffice.

We have, then, examples of depressions similar to that of Crater Lake produced by two very different modes of action. To which of them may we refer the origin of the magnificent crater of the Cascades? Just at present a confident answer cannot be given; for the ground has not been sufficiently studied. The facts brought to light by the first hasty reconnaissance seemed to indicate the explosive action, rather than the quiet method of subterranean fusion. But it is best to await the results of a more critical examination before committing ourselves to any opinion. It may be well, however, to state such facts as have already come to light, as well as some general considerations pertinent to the subject, and let them pass for what they are worth.

1°. In the Hawaiian calderas the evidences of sinkage are conspicuous. They are not confined to the deeper floors of the pits, but are also seen in the partial subsidence of great blocks or slices of the walls immediately enclosing them, and in irregular sunken spots in their vicinity, also in the marks of powerful shearing or faulting action in the walls themselves. They appear to be correlated to the remarkably quiet habits of the Hawaiian volcanoes, to their habitual modes of eruption, and to the special structure of the volcanic piles, which do not rise in steep conical peaks, but are very broad and flat. At Crater Lake, neither in the walls themselves, nor in the immediate neighborhood back of the crest-line, have any traces of sinkage been observed as yet. Nothing can at present be pointed out which suggests the Hawaiian mode of origin, beyond the fact that a vast crater is before us. The general structure and habits of the Cascade volcanoes are indicative of a more vigorous style of volcanic action than the Hawaiian.

2°. Crater Lake is the centre, and, without much doubt, the source, of an extraordinary quantity of andesitic pumice and tuff, which is scattered far and wide over a circle of country ranging from 40 to 60 miles in diameter. It often lies in beds several hundred feet deep, and covering hundreds of square miles. This pumice is not such as is often seen in some lava streams, but consists of rounded masses and pellets which seldom exceed a cubic foot in volume, and grade down to fine, light sand. It is the kind which is blown violently from a volcano during eruption, and projected high in air, to fall in showers over the surrounding country. It is found on the loftiest peaks and mountains anywhere within 20 miles of the lake, and assuredly did not emanate from the peaks on which it now lies. Vast quantities of it have been gathered up by the rains and streams (for it is lighter than cork), and swept eastward into the broad basins of Klamath Marsh and Klamath Lake, or carried westward through the Rogue River into the Pacific. The finer lapilli and sand have been consolidated into beds, which flank the eastern slope of the Cascades, and are also found west of its divide in the flatter spaces beyond the base of the truncated pile which holds the crater. These are well exposed in the walls of little box-cañons two or three hundred feet deep, and the tuff weathers out into pleasing columnar forms. The tuff is older than the pumice, for, wherever the two were seen together, the tuff was undermost. This light fragmental material, its wide distribution in every direction, with the lake as the centre of dispersion, the very light and highly vesicular character of the pumice,— all indicate that at some time Crater Lake has been the scene of some sort of very energetic volcanic action.

3°. But there is a weak point in the argument. If a large cone, composed of solid lavas such as are now seen in the walls of the lake basin, has been blown into rubble, and the fragments hurled far and wide over the surrounding country, ought we not to be able to recognize them in vast abundance in the vicinity? Most certainly we ought to. And yet in close proximity to the lake no fragments were noted, except such as we always expect to find at the foot of steep spurs and ridges of volcanic rock, and which have broken down from them in the ordinary course of weathering. This absence of the *corpus delicti* is a serious difficulty in the way of a speedy conclusion that the mountain was blown up by any such summary proceeding as Tomboro or Krakatoa, and indicates

the importance of further search after evidences of ingulfment.

Regarding the age of the caldera, it would be premature to offer any opinion, beyond the vague and general statement, that it is certainly many thousands of years old. There is abundant reason to hope, however, that further examination will throw some light on this question. We cannot, indeed, expect to reach any estimate of its age in terms of years and centuries; and our hope must be confined to that of fixing its relative age in terms of the geological calendar. Viewed in that relation, it may be said with equal confidence that its age is not great. C. E. Dutton.

THE FISH-CULTURAL STATION AT GLOUCESTER, MASS.

We are informed that it is the intention of Professor Baird, the U. S. commissioner of fisheries, now that methods and apparatus for hatching successfully the buoyant eggs of the cod, halibut, and other marine species have been devised, to prosecute the work on as extensive a scale as the means at the command of the commissioner will permit.

Gloucester, being the centre of the cod and halibut fisheries, furnishes unusual facilities for procuring an abundant supply of eggs within easy and convenient reach of the station, and has therefore been selected as the most advantageous location, for the extensive fish-cultural work with the marine species, now projected by the U. S. commissioner. The commission steamer, the Fish Hawk, thoroughly equipped for hatching-work, has been ordered to Gloucester, and will take her position in the outer harbor, at some convenient point where the anchorage is safe, the water pure and free from sediment, and of sufficient density to insure the buoyancy of the eggs during incubation.

All the usual methods for collecting eggs will be resorted to, and, in addition, it is expected to interest the fishermen themselves in the work of collecting by paying a reasonable price for impregnated eggs delivered at the station. Experimental investigations will also be made to determine the practicability of forwarding impregnated eggs from Gloucester to Wood's Holl and other stations to be hatched. The species which will chiefly engage the attention of the experts of the commission are the cod, halibut, haddock, herring, and the mackerel.

The results of the work with the halibut will be watched with special interest, both by fish-culturists and by those who are engaged in the fisheries. This fish is even more prolific than the cod-fish. Once in extraordinary abundance in Massachusetts and Ipswich bays, it has, within the memory of man, been almost exterminated in the area referred to. Have the conditions changed so as to determine the migration of the species to more congenial waters, or has man, by his direct agency in the fisheries, effected the extermination, over a given area, of a marine species of such marvellous fecundity? This is a question to which the work of the commission promises, in a few years, to furnish a satisfactory answer.

GREELY'S THREE YEARS OF ARCTIC SERVICE.

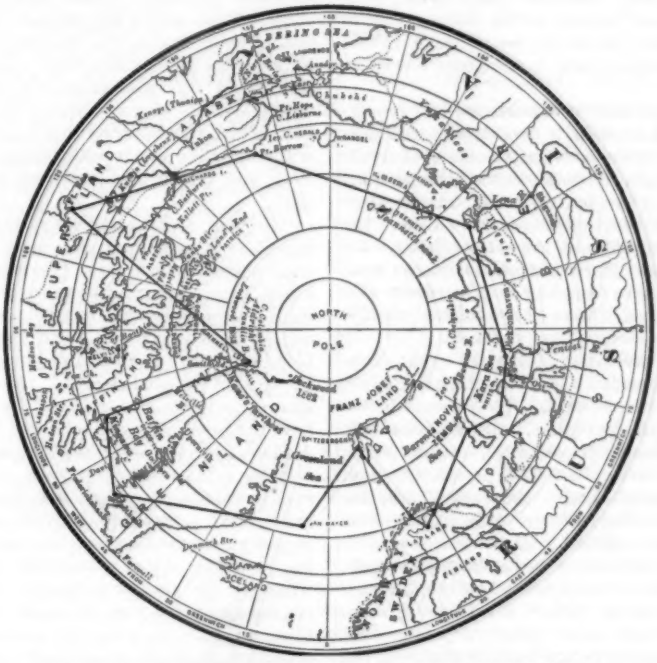
The name and fame of Lieut. A. W. Greely of the U. S. army now belong to the history of geographical research and of undaunted heroism. The pages of this journal have so often referred to his arctic explorations that it would be superfluous to review again the thrilling incidents of his perilous voyage. The scientific world is well aware that he was sent by the U. S. government as the leader of an expedition which was to co-operate with many kindred parties in the observation of physical phenomena in the extreme north; that this arduous enterprise was not for the gratification of personal or national pride by extending the coast-lines of the northern chart, or by carrying the flag a little nearer to the pole than it had ever been borne before; that it was not for the purpose of adding renown to the army, or glory to the explorers, but to help in solving important problems in terrestrial physics by a series of exact, patient, long-continued, and carefully recorded observations in the ice-bound regions of the north.

As long ago as 1875, Lieutenant Weyprecht of the Austrian navy, who had won experience and distinction in arctic researches, succeeded in calling the attention of the civilized world to the idea that future voyages should not be planned with reference to the increase of our knowledge of geographical boundaries, but rather to the ascertainment of scientific facts, by contemporaneous observations in well-chosen stations at the north, under the concerted actions of the most experienced men and the most enlightened governments. As a result of the acceptance of this idea, fourteen stations were established by eleven co-operating nations; namely, Austria, Denmark, France, Germany, Great Britain, Holland, Norway, Russia, Sweden, and the United States. Many astronomical observatories in different parts of the globe lent their aid to the project, so that the number of

Three years of arctic service. An account of the Lady Franklin Bay expedition of 1881-84, and the attainment of the farthest north. By Adolphus W. Greely. 2 vols. New York, *Scribner*, 1886, 8°.

stations observing in concert was more than forty. Seven hundred men, in all, were exposed to the dangers of arctic life; but so skilful were the arrangements that no man perished, with the unfortunate exception of some who were connected with the Lady Franklin Bay expedition, and not they until after their appointed duties had been successfully completed. The results of all these efforts are gradually becoming the possession of the scientific world. It will take a long while to reduce the observations and to publish them in proper form, and longer still to discover the laws which are suggested by the recorded phenomena; but the work projected has been done, and well done, and mankind will reap the benefits. Whether the results are more or less, Lieutenant Greely is right in saying that the work of the International polar commission will live in history, if only as an epoch in modern civilization, marked by the union of eleven great nations in planning and executing for strictly scientific purposes so expensive and dangerous a work.

For the services which were required in the Lady Franklin Bay expedition, Lieutenant Greely, although not a seaman, had some unusual qualifications. He had entered the army at the age of seventeen, and endured the privations and dangers of the civil war. After peace was established, he continued in the army as one of the officers of the signal service, and thus became expert in the kind of observations to be made at the north. His physical, intellectual, and moral qualities, as the sequel proved, were adequate to his great responsibilities, and, although disaster has cast a gloom over the close of his voyage, his conduct of the work intrusted to him deserves the highest praise; and the modest record which he has now published exhibits with great accuracy and comprehensiveness the various aspects of his expedition. His pages bear the stamp of trustworthiness. There is no boasting, no self-laudation, no concealment of the embarrassments which beset the party. There is a generous recognition of the parts which were performed by all his brave associates. There is a careful record of experiences which may be useful to other navigators. There are preliminary



ARCTIC REGIONS, SHOWING LOCATION OF CIRCUMPOLAR STATIONS, 1881–83.

[Reproduced through the courtesy of Charles Scribner's Sons.]

announcements of the scientific work of the expedition. There is no attempt at fine writing, even in those chapters which refer to most thrilling incidents; but throughout the volume may be traced the hand of a calm, observing, fair-minded, and unostentatious lover of the truth.

In thinking of the results of the Lady Franklin Bay expedition, the popular applause will commonly be given to the bravery of Lockwood and Brainard, who in May, 1882, attained the highest latitude yet reached by man (83° 23.8′ north[1]). Lockwood, unfortunately, died before the rescue of the expedition. Brainard came home, and, after eight years' service in the ranks, remains a sergeant, when his record would have gained him a commission at once in any other service in the world.

Another important reconnaissance was accomplished by Lockwood in a prolonged tour across Grinnell Land, where a remarkable series of fertile valleys was found, in which herds of musk-oxen pasture. Over a hundred of these animals were killed, and two hundred others were seen. The glaciers of Grinnell Land are extraordinary. On the shores of Lake Hazen, Greely discovered what he believes to have been the most northerly permanent habitation of man that is known, though the inhabitants thereof have vanished.

The physical observations proposed by the Hamburg polar conference were maintained from July 1, 1881, until June 21, 1884, — forty hours before the rescue of the survivors. Observations as to atmospheric pressure, temperature, and dew-point; direction and force of the wind; quantity, kind, and movement of clouds; the aurora, and the state of the weather, — were made hourly after Fort Conger was reached. Of the magnetometer (by which the declination of the magnetic needle was noted) there were ten hourly readings, except on the 1st and 15th of every month, when the readings were much more frequent. The magnetic inclination or dip was also observed, but the instrument was so poor that the value of the record is seriously impaired. Tidal observations, which promise to be of much value, were likewise made. Great pains were taken to secure accurate observations of the pendulum as a contribution to geodesy. Air samples were secured, but abandoned on the retreat. The velocity of sound at low temperatures was noted. Each day there were 526 recorded observations, — 264 magnetic, 234 meteorological, and 28 tidal. Careful memoranda were made upon the diet of the members of the party, and upon all the circumstances which tended to keep up their health; and the chapter on hygiene and routine is by no means the least important in the volumes. Geological, paleontological, zoölogical, botanical, and ethnological facts were noted whenever there was opportunity to collect such information. On all these points the appendixes are very full.

[1] Markham's highest point in 1876 was 83° 20′ 26″.

It only remains for us to add that these volumes are printed in a most attractive manner, and that the illustrations and maps are abundant and satisfactory. In all respects the book is a credit to the author and the publishers. We purposely avoid here all comment on the cause of the sad failure to relieve at the appointed time the party, and all questions in respect to the imperfections of the outfit. There was a sad lack of thorough attention to some details, — a lack which has greatly impaired the satisfaction with which the expedition would otherwise have been regarded. But Greely and his brave comrades have borne their part nobly, and we trust that a grateful republic will ponder the words with which these volumes close, and act, through congress, before it is too late.

"No man of the party has received promotion, except such temporary advancement as my personal urging could secure. Two men, with broken health, have adventured their private fortunes; and one, a most self-sacrificing, soldierly, temperate, and loyal man, lies, as these lines are penned, helpless in a city hospital, aided by private charity, his pension not even awarded. Even the meagre allowances originally promised for arctic service have not been fully paid, and the widows of the dead are generally as yet unrecognized.

"Our great country in these days asks not in vain for its sons to venture their lives for any idea which may subserve its interests or enhance its greatness. I trust that posterity may never mourn the decadence of that indomitable American spirit which in this generation fought out to the bitter end its great civil war, and made it seem an easy thing in time of peace to penetrate the heart of Africa, to perish in the Lena Delta, to die at Sabine, or to attain the farthest north."

LONDON LETTER.

All friends of scientific education, as well as a wider circle, hail with the greatest satisfaction the appointment of Sir Lyon Playfair, the present president of the British association for the advancement of science, to the post which is practically minister of education under Mr. Gladstone's government, which has just been constituted. For many years Sir Lyon Playfair was chairman of committees of the house of commons, and at one time he held the position of postmaster-general in a former government. It is often re-

marked, with some justice, that in the formation of an English government, from political and party considerations, the round men get put into the square holes, and *vice versa*. In the present appointment it is pre-eminently a case of the round man being fitted into the round hole. Probably no man in the house, with the possible exception of Sir John Lubbock, M.P. for the University of London, is listened to with more respect on educational questions than Sir Lyon Playfair.

Mr. D. Morris has been appointed to the post of assistant director of the Royal gardens, Kew, as successor to Prof. W. T. Thistleton Dyer, who became director on the resignation of Sir Joseph Hooker. Mr. Morris has spent some years in Jamaica as director of the public gardens and plantations, and has brought both the gardens at Kingston, and the cinchona plantations, to a very high state of efficiency.

Two new lectureships in biology have been lately established at the University of Edinburgh. The present occupant of the natural history chair is Prof. J. Corsar Ewart, whose work in connection with the fishery board for Scotland is well known; and Mr. George Brook, who has for some time past been making investigations upon fish ova for the same board, has been appointed as lecturer upon comparative embryology. Still more recently another lectureship has been endowed by Lord Rosebery. Mr. E. J. Romanes, F.R.S., has accepted the post, and in the course of the next five years will deliver thirty lectures on the philosophy of natural history. The University of Aberdeen is losing its professor of physiology, Dr. William Sterling having been called to Owens college, Manchester, as the successor of Dr. Gamgee, who is about to devote himself to professional work in a more southern climate than that of Manchester. Mr. Gilbert C. Bourne has just returned from the Chagos Archipelago, where he has been spending the last six months in zoölogical work. He has made extensive collections of the terrestrial fauna and flora, and also of the corals, some of which are probably new, while he has also devoted some time to embryological research.

At the last meeting of the Society of telegraph engineers and electricians, a very remarkable paper was read by the president, Prof. D. E. Hughes, F.R.S., as his inaugural address, on "Self-induction of an electric current in relation to the nature and form of its conductor." The researches were made with a combination of the author's induction-balance, with a Wheatstone bridge, called an 'induction bridge.' Among the practical points resulting from these researches may be mentioned a very decided verdict in favor of the ribbon form of lightning conductor, a solid rod of iron being regarded by the author as the worst possible form. Another point hitherto little understood, but first pointed out by Mr. W. H. Preece at the Aberdeen (1885) meeting of the British association, was cleared up; viz., why, when an iron and a copper wire of equal resistance and static capacity were used for telegraphing between London and Newcastle, 278 miles, there was an increase of speed in the copper line of 12.9 per cent as compared with the iron. The discussion on this paper tomorrow evening is looked forward to with great interest. W.

London, Feb. 10.

NOTES AND NEWS.

IN order to give an opportunity for definite and systematic effort by all those who believe that our birds ought to be protected, the *Forest and stream* has recently founded the Audubon society. Membership in this society is to be free to everyone who is willing to assist in forwarding any one of the three objects for which it is established. These objects are to prevent so far as possible (1) the killing of any wild bird not used for food, (2) the destruction of the nests or eggs of any wild bird, and (3) the wearing of feathers as ornaments. The work to be done by the Audubon society is auxiliary to that which is being done by the American ornithologists' union committee, and will consist largely of matters of detail, to which this committee could not attend. The management of the society for the present will be in the hands of a member of this committee. Branches of this association will be established all over the country. The work of the *Forest and stream* is only preliminary. As soon as the society shall have attained a respectable membership, and be on a firm footing, it will be turned over to its members for final organization. In order that this may take place as speedily as possible, it is hoped that all interested in bird-protection will send in for membership their own names, as well as those of any others whom they think likely to assist. To all such, free circulars containing information will be sent for distribution. Names should be sent without delay to *Forest and stream*, 40 Park Row, New York, N.Y.

— The commission appointed to consider the question of consolidating several of the scientific bureaus of the government are progressing slowly with their work, and a report is not looked for within several months. It is authoritatively learned that the signal office is the chief obstacle in the way of any proposed change, and of an early settlement of this important question. A

strenuous effort will be made by those interested in this service, to prevent a consolidation, or any curtailment of its powers. The temper of the commission is decidedly in favor of consolidating some of the scientific bureaus, and a recommendation to this effect may confidently be looked for.

— It is proposed to establish a permanent exposition in Washington, preparatory to a world's exposition in 1892 to celebrate the fourth centennial of the discovery of America.

— A bill is now before congress to extend the reports of the signal service for the relief of farmers. It is proposed to forecast "cold waves, rains, storms, and marked inclemencies" of the weather, by establishing danger-signals at telegraph-stations all over the country.

— The exploration of the ancient mounds in Manitoba promises interesting results. It appears from surveys made during the past summer that the northern limits of the mound-builders lie beyond the Red River of the North. Along this river and Lake Winnipeg, mounds were found identical in structure with the famous ones of the Ohio and Mississippi valleys.

— An act of incorporation, establishing a zoölogical society in Washington, was passed in 1870; but nothing, so far, has been accomplished toward carrying into effect the provisions of its charter. Mr. P. T. Barnum now proposes to establish a zoölogical garden there, if congress will grant the use of thirty acres of the reclaimed lands on the flats for the purpose, and the privileges vested in this society. He offers to expend $200,000 in improving and beautifying the garden.

— The mineralogical collection of Mr. C. S. Bement of Philadelphia is said, by Professor Rath of Germany, to be undoubtedly the most remarkable private one in existence. It is especially valuable for the richness and perfection of its rarer forms, and for its completeness of authentic species. It includes, according to Mr. Kunz, over 10,500 specimens.

— It appears that Columbia college was not the first to act upon the Tyndall scholarship (not 'fellowship'), as stated in the last issue of *Science*. Harvard college took action in regard to the matter nearly three months ago, and at that time appointed Mr. H. H. Brogan, of the class of 1885, as the first incumbent. He was in Europe at the time, and began his studies immediately.

— Jacob v. Tschudi, the well-known South American traveller, archeologist, and naturalist, died Jan. 25, at St. Gall, Switzerland, aged sixty-eight.

— Preparations for the international horticultural exposition at Dresden, Germany, which will be held next May, are progressing rapidly. The chief exhibition-hall will comprise nearly 24,000 square feet of space; and there will be, in addition, another building, with more than double the superficial area, to contain the more delicate plants.

— An interesting fact in connection with the trephining of an Inca skull, recently described in the Proceedings of the national museum, is recalled by Mr. J. W. Taylor of Roxbury, Mass., who states that Dr. Rink, during his travels in Labrador, recorded the story of an Eskimo family that lived near a people who built their houses of bowlders. The latter were hostile to the Eskimo, and, when they took them prisoners, they put them to death by boring a hole in their foreheads with these stones.

— The importance of bacteriological studies has been recognized by the U. S. army and medical museum by the institution of extended laboratory work in the cultivation of the various forms and varieties of these microscopic organisms. Especial pains have been taken by Dr. Billings, the curator, to introduce all the latest methods and apparatus, so that the facilities are now quite equal to those of foreign laboratories. Solid culture media only are employed, as gelatine, blood-serum, potato, bread, and agar agar; and excellent results have been attained in the culture of the principal pathogenic forms. Many specimens are on exhibition, illustrating the germs of various diseases. The chromogenic forms are seen growing upon slices of potato, and represent almost every tint of the rainbow. The value of such laboratory work at the present time is unquestionably great.

— The entire number of books published in the United States during 1885, as compiled by the *Publishers' weekly*, amounts to 4,030, a decrease of about 50 from that of 1884. In education and language there were 225, a decrease of 2; medical science and hygiene, 188, a decrease of 21; social and political science, 163, a decrease of 5; physical and mathematical science, 92, a decrease of 42; mental and moral philosophy, 25, an increase of 6. The loss has been greatest in works on science and the useful arts, and the greatest gains were on religious, theological, and juvenile works. The largest number of works, 934, as usual, were of fiction, with theological, law, and juvenile books coming next, each with about 400.

— The Museum of hygiene at Washington contains a metallic burial-casket similar to that sent to Siberia to receive the body of Captain De Long, who perished at the Lena in October, 1881. These

caskets are designed to preserve the body in nearly a natural state by excluding the air. The body is surrounded with ground cork, and the lid of the casket is carefully cemented with white lead; it is then wrapped in a layer of thick felt, and placed in a tightly constructed pine case, which is completely filled with the ground cork. The seams of the pine box are carefully covered with white lead, and the whole is enveloped in another thick wrapping of felt; over the latter is a covering of burlap, secured by stout cords; outside is a pine crate. These caskets are believed to be the best ever made for the preservation of the dead; and the great success achieved in the transportation of the remains of De Long and his companions would seem to indicate their entire feasibility for general use in similar instances, or where bodies are to be transported long distances through many climatic changes.

— The herbarium of the national museum at Washington now embraces over 25,000 specimens, representing 17,000 species, and is established upon a broad basis, which admits of almost unlimited expansion. The North American flora is represented by about 7,000 species, contributed by Ward, Canby, Havard, and others, and is constantly increasing. The herbarium is also rich in European species, the gift for the most part of the authorities at Kew, and chiefly from the collections of George Curling Joad and J. Gay. This material, however, represents only a small portion of the national herbarium, the greater part of which is yet at the department of agriculture, where the government collections were formerly deposited before the erection of the national museum building. Case-room is provided, and the specimens are permanently mounted and systematically arranged according to the system adopted by Bentham and Hooker in their 'Genera plantarum.' The collection is rendered easily accessible by means of a card catalogue, and Roman and Arabic label numbers for order and genus on each genus-cover. The herbarium is placed in immediate connection with the department of fossil plants, and under the same curatorship. It is intended that all duplicate material shall represent either additional parts of plants or widely different localities, as illustrating their geographical range, local variation, etc. Other duplicates will, however, be utilized in effecting exchanges for species not represented.

— The *Berichte der deutschen botanischen gesellschaft* contains the interesting results of a number of experiments recently made by Strasburg upon the grafting of solanaceous plants. Jimson-weed (Datura stramonium) and 'wintercherry' (Physalis alkengi) were ingrafted upon potato-stocks, with immediate union; and with the tobacco-plant less speedy though equally successful results were derived. Grafting deadly nightshade (Atropa belladonna) and henbane (Hyoscyamus niger) was accomplished with more difficulty. Other attempts also succeeded in ingrafting the potato upon the nightshade (Solanum nigrum), tobacco, and wintercherry, though with less ease. Not only were union and growth secured between these different solanaceous plants, but also between the potato and Schizanthus Grahami, a Chilian scrophulariaceous plant, upon which the potato-fungus grows. The development in this last, however, was feeble. In none of these experiments did there appear to result any modifying influence upon the stock. The potato produced tubers as usual, though there appears to have been a greater number of irregular forms. With the jimson-weed the tubers were well developed, but no seeds were produced. On the other hand, tobacco-plants fructified abundantly, with only a sparse growth of tubers. Reserve material does not seem to be sufficient to admit of both seeds and tubers together. Potato-plants grafted on others seemed to possess a superabundance of reserve material, however, resulting in the growth of tubers of the size of a walnut, in the axils of the leaves. The 'eyes' of these tubers, it is interesting to state, developed leaves of considerable size. This growth of tubers above ground has been previously observed in the potato-plant, where the stem had been crushed close to the surface.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Sea level and ocean-currents.

ACCORDING to Zöppritz, the winds were thousands of years in overcoming the inertia of the water, and causing the present ocean-currents. Of course, during the latter part of this long period, after their effect had extended down to the bottom of the ocean, a part of their force was spent in overcoming the friction over the bottom, and toward the last a very small part only in accelerating the motion. But according to the same authority, after 239 years, while the whole force of the winds was spent upon the inertia of the water, only one-half the surface velocity was communicated to the stratum at the depth of 100 metres; and so at the depth of a few hundred metres there was yet very little velocity. The greatest surface velocities in the open sea, supposed to be due to the winds, are, on the average, not more than ten miles per day. The whole amount of momentum, therefore, caused by the action of the winds, is only about equal to that of a stratum 100 metres in depth, with a velocity of ten miles per day, the amount of momentum below 100 metres in depth being about necessary to reduce that above 100 metres to the mo-

mentum, corresponding to that of a uniform velocity of ten miles per day for all the strata. We can only judge of the force of the winds, as exerted upon the surface of the ocean, by the amount of momentum produced in a given time; and, from the small amount of momentum produced in so long a time, this force must be very small.

Let us now examine the effects of gravity as called into play by the gradients of the strata of equal pressure, arising from unequal upward expansions due to differences of temperature. Referring to my notes upon this subject, I make the following extracts from a larger table, in which the temperatures and the upward expansions are given for three stations at the given depths in the first column: —

Depths in fathoms.	Equator.		Lat. 23°.2 N. Long. 38°.7 W.		Lat. 37°.9 N. Long. 41°.7 W.	
	Temp.	Expan.	Temp.	Expan.	Temp.	Expan.
0	25°.5C.	5.1ft.	22°.2C.	7.8ft.	21°.1C.	8.5ft.
50	17 .7	3.9	—	—	—	—
100	13 .1	3.2	19 .4	5.8	17 .5	6.7
200	8 .1	2.8	14 .8	4.6	15 .9	5.2
300	5 .7	2.4	11 .4	3.6	15 .6	4.0
400	4 .6	2.0	8 .7	2.8	12 .7	3.0
500	3 .8	1.8	6 .5	2.3	8 .2	2.3
600	4 .0	1.6	5 .4	2.0	5 .3	1.9
700	3 .9	1.4	4 .8	1.8	4 .8	1.7
800	3 .9	1.2	4 .1	1.6	3 .4	1.6
900	3 .4	1.1	4 .0	1.5	3 .2	1.5
1000	2 .7	1.0	3 .5	1.4	3 .2	1.4
1500	2 .3	0.6	2 .0	0.9	2 .7	0.9

The temperatures are the means of six soundings of the Challenger expedition, as given by Dr. Croll; and the upward expansion, computed from Dr. Hann's formula for the density of sea-water, is that arising from the differences of temperature at the different depths, and that of the maximum density of sea-water in the polar regions. The temperatures at the bottom of the stations, ranging in depth from 2,500 to 2,700 fathoms, were a little less than 2°. The upward expansion of the surface at the equator is a little greater than that of Dr. Croll (4.5 feet), obtained by means of Muncke's tables, but the difference is of no consequence.

It is seen that the temperatures and upward expansions diminish rapidly near the surface, and that the latter are small in the lower depths. Supposing, for simplicity, that the gradients are uniform from the equator to the latitude of maximum density, say 5,000 miles from the equator, then the average gradient of the whole mass of the ocean, down to the depth of 2,500 fathoms, is about 1.5 feet in 5,000 miles, instead of 5.1 feet, as at the surface. The force, therefore, down this average gradient, of the whole mass, is to that of gravity about as unity is to 18,000,000. It is readily found, from computation, that this force down this small gradient would give to the whole mass, in four days, a velocity of ten miles per day. According to Zöppritz, the whole action of the winds in 239 years produced only this amount of velocity on a surface stratum of 100 metres in depth, say one-fiftieth part of the whole depth. To produce an amount of momentum, therefore, equal to that of the whole ocean, with a velocity of ten miles per day, would require nearly 12,000 years. Comparing, now, four days with 12,000 years, we get an approximate idea of the relative strengths of the two forces, for these must be inversely as the times required to produce a given amount of momentum.

The force of the winds upon the ocean, therefore, in comparison with the gravitation force, is almost infinitely small, if Zöppritz's results are to be accepted. But I have never accepted these, and therefore regard this simply as a very strong *argumentum ad hominem* on the subject to anyone who accepts them, and also maintains that the winds have any sensible effect in causing ocean-currents. Of course, a very small force, with time enough, will produce any given amount of momentum; and so the winds, in time, could have caused an amount of motion equal to that observed in the ocean, if no other forces had been in operation; but with other forces many times greater, causing both vertical and horizontal circulations, of course the effects of the infinitely small force would be entirely lost.

In the flowing of rivers down a gradient, knowing the gradient and the mass, we have a measure of the force required to overcome the friction; and thus, from the known depth and velocity, it is easy to obtain approximately the value of the friction-constant. From any considerations of this kind I have never been able to obtain a friction-constant nearly so small as that assumed by Zöppritz, and therefore think it is many times too small as applied to rivers or ocean-currents.

If we assume that the winds can cause the given amount of momentum in one year, instead of 12,000, we still have their force upon the ocean nearly 100 times less than the gravitation force; and I think good judgment in the matter would decide that a year, at least, would be required for the slight action of the gentle winds blowing over the ocean to give an amount of momentum equal to that of the whole mass, with a velocity of ten miles per hour. I cannot think, therefore, that the effect of the winds is more than one-hundredth part of that of the gravitation force.

Professor Davis seems to think that the gravitation force is too small, even allowing it a long time to act, to move the whole mass of the ocean. But the greatest tidal gradients with reference to the resultants of gravitation and lunar forces, are little, if any, greater than that of fifteen feet in 5,000 miles; yet these move the whole mass of the ocean to the bottom back and forth twice a day, causing regular elevations and depressions of the surface, now high water, and six hours after, low water. The maximum tidal velocities for all depths amount to a velocity of nearly a mile per day. I do not think a quarter-diurnal reversal of the directions of the winds would give rise to reversed velocities of that amount to a stratum of the depth of ten metres; and so the effect of the winds would be about 150 times less than that of the tidal forces, which are about the same as those of the gradients arising from the differences of temperature.

The regular gradients from the equator to the polar regions must be regarded as the initial ones, and consequently the forces arising from them, as the forces which overcome the inertia of the water before the final motions have been fully established. But the directions of the initial motions are very much modified by the deflecting forces of the earth's rotation, and the distribution of the temperature disturbances somewhat changed. An interesting example of this kind is indicated by the temperatures of the last two stations of the preceding table, from which it is seen, that, in the region of the Sargossa Sea, the high temperatures extend down to greater

depths, and the consequent upward expansions are greater. This is caused by the gyratory motion of the water around this region. The deflecting force of the earth's rotation arising from this motion, being on all sides to the right of the direction of motion, drives the surface water, together with the seaweed from all sides, into this region; so that there is a little heaping-up of the water in this region above that caused by the greater upward expansion: and this causes a settling-down and a flowing-out at all sides below, where the gyratory velocity, on account of greater friction, is less, and the consequent inward pressure toward the central part less, than they are above. This carries the warm surface water downward, and makes the average temperature for all depths and the upward expansion greater here than in the surrounding parts; and this, together with the slight accumulation of the mass in the region of the Sargossa Sea, raises its level several feet.

Where wind drives the water against a barrier or shore, as in the case of Lake Ontario or the Atlantic Ocean, regular progressive currents from top to bottom in the same direction cannot be established; but the surface water which is driven forward must return below, or at the sides if the wind blows over the middle part only. In such cases the greatest change of sea-level takes place soon after the winds begin to blow in any given direction, while the whole force is spent upon a comparatively thin stratum. It is well known that winds blowing over a very shallow stratum of water, or along the length of a very shallow canal, may produce a considerable change of level; whereas, if the depth were considerable, the change would be but little. At first, while the whole force of the wind is spent upon the surface water of a lake or ocean, the great body of undisturbed water below is the same as so much solid matter. But after the surface water has been driven to one side, and the pressure there increased, which gives rise to the return current below,—when this has been fully established, the difference of sea-level at the two sides or ends, from and to which the wind blows, is less.

W. FERREL.

Washington, D.C., Feb. 12.

The Davenport tablets.

Please allow me to trouble you once more, and finally, in reference to the Davenport tablets.

Mr. Putnam says, "If Professor Thomas will take the Grave Creek tablet, or even the famous Rosetta stone, and sit down before them with his Webster's 'Unabridged,' he will find no end of similar resemblances." Very true, as the alphabets used on the Rosetta stone are some of those given by Webster, and the characters on the Grave Creek tablet have been taken from half a dozen different alphabets, which is one of the chief reasons why it is generally rejected by modern archeologists (see Dr. Wilson's scathing criticism in his 'Prehistoric man,' third edition, vol. ii. pp. 99–111).

Mr. Putnam's criticism of Mr. Tiffany's letter, on account of illiteracy, is in strange contrast with the records of the Davenport academy, which show that Mr. Tiffany was one of its four original organizers (Proc., vol. vi. p. 1), was a member of the museum committee, was one of the board of trustees named in the constitution and articles of incorporation, was a member of the committee on finance (Proc., vol. i. pp. 4, 7, and 8), was more than once selected as one of a committee of three to draught resolutions (Proc., vol. i. pp. 23 and 71), was one of a committee of two appointed to take steps toward erecting a building, was for some years treasurer of the academy (Proc., vol. i. p. 67), and did considerable mound-exploring, for which special credit is given in the president's annual address of 1876.

It is true that in the letter, from which I quoted only so much as touched upon the points then under discussion, Mr. Tiffany expresses entire confidence in the shale tablets, which is proof that his expression of doubt in regard to the 'limestone tablet' was not for the purpose of 'defaming his old associates,' but because the evidence satisfied him it was a plant.

In answer to Mr. Putnam's singular philosophy respecting the entrance of water into the little vault where the limestone tablet was found, it is only necessary to refer to the figure and description of mound 11, heretofore given. As neither cement, plastering, clay, nor mortar was used, it would have been, as every mound-explorer knows, a miracle if water had failed to enter the vault, and, in the course of centuries, fill it with dirt. Moreover, in the course of time the superincumbent weight would have pressed the slab which covered the vault down upon the tablet.

Archeologists, so far as they have spoken, have, almost without exception, indicated in their published works a want of faith in these tablets. Short, in his 'North Americans of antiquity' (p. 40), says, "The above conjectures as to the significance of the representations on these tablets are based upon the supposition that they are genuine, and not the work of an impostor, *of which we cannot refrain from expressing a slight suspicion.*" Rev. J. P. MacLean, speaking of the cremation scene, says, "Among the cabalistic characters, the word 'town' stands out in bold lines, and the figure '8' appears in rude shape among other marks. The picture of a face occurs in the sun, resembling the face of a European. The artist has overdone his work: *it needs no further investigation*" ('Mound-builders,' p. 116). Yet Mr. MacLean is one of two (Dr. Willis De Haas is the other), of whom Mr. Putnam remarks in his recent annual address to the academy, as published in the local papers, "There are thus no more competent archeologists in the country." Mr. Peet, in the *American antiquarian* of July, 1878, expresses the same opinion as Mr. MacLean. Prof. M. C. Read, in the *American antiquarian* of April–July, 1882, expresses a doubt as to their authenticity, based upon the characters they bear. Dr. E. Schmidt, in an article entitled 'The mound-builders and their relation to the historical Indians' (*Kosmos*, 1884, p. 146), remarks, "It is hardly necessary to be pointed out that none of the notorious tablets are without suspicion, and that all which have been subjected to earnest investigation have turned out to be gross forgeries." It appears from these notices that I am not alone in expressing doubt as to the authenticity of these tablets.

Notwithstanding the kind invitation of the academy to visit their museum and inspect the tablets, I preferred, for the present, to base my arguments on the publications of the academy (the albertypes included) and the statements of its members, as this avoided recourse to personal judgment, and appealed only to what is before the public. Even the extracts from Mr. Tiffany's and Mr. Pratt's letters were in

confirmation of Mr. Harrison's published account of the finding of the limestone tablet. If this evidence leads to the conclusion that these relics are modern productions, as I believe it does, there is no necessity for the present of 'further investigation,' — a conclusion Mr. MacLean seems to have reached while writing his 'Mound-builders.' CYRUS THOMAS.

The claimed wheat and rye hybrid.

In *Science* of Jan. 15 appears an article from Dr. Sturtevant, which, to save words, I will call a criticism of an account of my rye and wheat hybrids, published in the *Century magazine* of last January by Charles Barnard. Mr. Barnard, after an examination of the plants at my place last summer, gives their history, accepting, without question, their hybrid origin. Dr. Sturtevant, who also examined them last summer, begs to dissent. He considers the evidence adduced only 'sufficient to establish grave doubts.'

While we were on our way to the plots, Dr. Sturtevant remarked that he wanted me to know that he was 'incredulous as to the whole thing.' While we were returning, he said, "I am convinced that they are hybrids, but I question whether they will not be found to be distinctly either wheat or rye." In the *Science* article referred to, he next states that he has compared the pictures of a few of these heads which appeared in the *Rural New-Yorker* with those of five old varieties which he mentions, and finds them closely alike. Then he remarks that he does not question the 'attempt at a cross.' The 'variability effected is,' he admits, 'indicative of a foreign pollen.' This variability, which he believes not to be due to hybridization, the doctor explains by an 'hypothesis.' It is that under the stimulus of the rye pollen, atavism has resulted, whereby varieties dormant in the wheat (female) plant have made their appearance. Finally he expresses the hope that some one, expert in agricultural botany, may 'investigate a series of these specimens.'

Dr. Sturtevant, though he states that he has carefully studied the 'published claims,' has apparently overlooked the published fact that specimens of these hybrids have been sent to no less than six well-known botanists, several of whom have replied that they were evidently hybrids, while others replied to the effect that the hybridization was a most interesting fact, etc.

Now, if we emasculate the florets of a head of wheat while the anthers are immature, and repeatedly apply rye pollen, and thus succeed in attaining ten grains, from which, in three years, at least fifty different varieties appear, differing as widely as any known wheats differ from each other, while some of them resemble rye more than wheat, can anyone reasonably doubt that a hybridization was effected? Why assume any thing else whatever? What does Dr. Sturtevant mean by ascribing such changes to the 'stimulus of foreign pollen' as something different from the sexual effect of foreign pollen? Suppose atavism is shown in some of these: does it not prove, all the same, that hybridization was effected? A hybrid may show all, some, or none of the characteristics of either parent, and still be a hybrid, as has often been revealed in the later seedling progeny.

In drawing resemblances between the pictures in the *Rural New-Yorker* and those of which he speaks, the doctor, very likely, forgets an important fact; viz., that in many of the heads of the plants most resembling rye, the spikelets bear but two kernels, while many are wholly abortive. Again: the botanical relationship is marked not only by narrower glumes, by fewer florets and grains, but by the fact that the culms beneath the head for an inch or so are hairy, — a characteristic that never occurs on wheat culms. The color of both the culms and leaves is also distinctly lighter (more glaucous) than that of wheat, and the habit of the young plant is that of rye. E. S. CARMAN.

A recent ice-storm.

The trees in central Massachusetts, along the line of the Boston and Albany railroad from Worcester to Spencer, suffered severely from the weight of ice formed upon them during the storm of Feb. 11–13, that caused the recent destructive floods. It was noticeable that the trees which exposed the largest surface for the attachment of ice did not suffer most: the pines with their green needles, and the oaks with their dead leaves, generally escaped injury; and the slender birches were saved by bending instead of breaking. But from five to twenty per cent of the other deciduous trees were more or less hurt. The side limbs were not often broken: it was nearly always the vertical top-stems that sustained the most injury, apparently because their natural position was farthest from that into which the weight of the clinging ice forced them.

Can some of your readers furnish direct observational evidence to show why the pines and leafy oaks escaped, while the bare trees were so much damaged?

W. M. DAVIS.

Cambridge, Feb. 20.

Corrections of thermometers for pressure.

If any of your readers interpreted our reference in *Science*, Feb. 12, to a letter from the signal office, as your correspondent, Sig., feared they might do, we regret it, and are glad that the import of that letter has been fully explained. We are well aware that many of our text-books on heat refer to the effect of pressure on the thermometer, and state how to prevent it in some instances. The effect of appreciable changes of pressure on the thermometer seemed to us to be sufficient to demand correction in all accurate thermometric work. If such corrections are generally made, they are omitted in the report of experiments.

F. P. VENABLE.
J. W. GORE.

University of North Carolina, Feb. 22.

Is the dodo an extinct bird?

Referring to Dr. Shufeldt's article (*Science*, vii. 145) respecting the supposed present existence of the dodo, it may be desirable to state, for the benefit of those who are not already aware of the fact, that the so-called dodo from Samoa, mentioned in the clipping 'from an English newspaper,' is not the dodo at all, but the dodo-pigeon, Didunculus strigirostris, a living specimen of which was last year presented to the national museum by Dr. T. Canisius, ex-consul of the United States at Samoa. This specimen was, at latest account, thriving in the zoölogical garden at Philadelphia. ROBERT RIDGWAY.

Smithson. inst., Feb. 15.